

SPHENIX	01/15/2015	P. Giannotti
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4. WBS Element Code	5. WBS Element Title
1.09.01 Installation	Project Management and Oversight

6. Index Line Number:	7. Revision Number and Authorization:	8: Rev. Date

9. Approved Changes

9. Element Task Description
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**COST CONTENT:**

Labor cost only, no material. Labor based on Subsystem scientist with 10% of time and subsystem engineer 50% time spent on project management of this task.

**TECHNICAL SCOPE:**

Level 2 engineer & scientist overseeing and managing the infrastructure work, including presentations, reports, budgeting, etc.

**WORK STATEMENT:**

Manage and guide the scientific and engineering management of sPHENIX infrastructure tasks, including:

1. Monitoring and scheduling progress towards evaluating existing PHENIX infrastructure and determining which aspects of PHENIX infrastructure (a) will be utilized on sPHENIX without modification, (b) will modified from PHENIX configuration to sPHENIX specific requirements (c) will not needed at all for sPHENIX and determining what new infrastructure items will be needed for sPHENIX.
2. Supervising and managing the design of new sPHENIX Infrastructure items and the design of modifications to existing PHENIX infrastructure.
3. Supervising and managing the production of new sPHENIX Infrastructure items and the production of modifications to existing PHENIX infrastructure.

**Notes:**

1. Decommissioning and disposition of existing PHENIX infrastructure is covered in WBS Item 1.02.
2. Assembly and Installation of existing PHENIX infrastructure is covered in WBS Item 1.10.

1. Project Title:	2. Date:	3: Person Responsible
SPHENIX	01/15/2015	P. Giannotti

4. WBS Element Code	5. WBS Element Title
1.09.02 Installation	Infrastructure System Design

6. Index Line Number:	7. Revision Number and Authorization:	8: Rev. Date

9. Approved Changes

9. Element Task Description
<p><b><u>COST CONTENT:</u></b></p> <p>All costs in this Item are labor based, no material costs. All labor costs are based on engineering estimates for scientific, engineering and other technical professional's contributions to the design and documentation associated with the technical items listed below.</p> <p><b><u>TECHNICAL SCOPE:</u></b></p> <p>This item includes all tasks required to specify and design the following SPHENIX infrastructure items:</p> <ul style="list-style-type: none"> <li>a. Mechanical support structures (those structural components of the SPHENIX detector which integrate and structural support the various detector subsystems that comprise the SPHENIX detector, including the Central support pedestal carriage base, base to HCal support, Base to bridge support, bridge, mid platform, Inner HCal to outer HCal support rings, Tracking support, flux return end caps and magnet support mounting and associated alignment features)</li> <li>b. AC Line Electric Power distribution design</li> <li>c. Cryogenics Supply Support Design (Note: this includes only structural support for routing of cryo supply. Actual cryo transfer lines and all associated plumbing and control hardware are part of the Magnet WBS item #1.03)</li> <li>d. Beampipe/Vacuum Design</li> <li>e. IR HVAC Design</li> <li>f. IR Electronics Cooling Water Design</li> <li>g. Safety Subsystems Design</li> <li>h. Detector Support Services Systems Design</li> <li>i. Detector Support Services Systems Design</li> <li>j. Non -IR Infrastructure Design</li> </ul>

## WORK STATEMENT:

The efforts required to complete this WBS item are described for the various subtasks as follows:

**Mechanical Support Structures Design** - This task encompasses design of IR modifications and structural supports for the sPHENIX magnet cryo transfer line. All detailed tasks involving the design of piping, valves, cryo storage, instrumentation and control of LHe (and LN2?) to sPHENIX SC Magnet are described under the Magnet WBS details.

Deliverables: drawings: estimated 8 assembly, 57 detail, 1 outline/interface, 1 layout and 1 envelope drawing.

**AC Line Electric Power Distribution Design**- This task encompasses all detailed tasks involving the evaluation of existing beampipe equipment and the design of new/modified/repurposed beampipe sections, beampipe supports throughout the IR, vacuum valves, pumps, controls, etc.

Deliverables: drawings: estimated 5 schematics.

**Cryogenics Supply Support Design** - This task encompasses all detailed tasks involving the evaluation of existing IR environmental control system and the design and specification of new/modified repurposed HVAC equipment including Air conditioning units (air handlers and compressor/condensers), thermostatic controls, humidity control, etc.

Deliverables: drawings: estimated 1 schematic and 20 detail drawings.

**Beampipe/Vacuum Design** - This task encompasses all detailed tasks involving the evaluation of existing beampipe equipment and the design of new/modified/repurposed beampipe sections, beampipe supports throughout the IR, vacuum valves, pumps, controls, etc.

Deliverables: drawings: estimated 4 assembly, 1 schematic, 5 detail drawings

**IR HVAC Design** - This task encompasses all detailed tasks involving the evaluation of existing IR environmental control system and the design and specification of new/modified repurposed HVAC equipment including Air conditioning units (air handlers and compressor/condensers), thermostatic controls, humidity control, etc.

Deliverables: drawing: estimated 1 schematic/layout drawing

**IR Electronics Cooling Water Design** - This task encompasses all detailed tasks involving the evaluation of the existing PHENIX experimental cooling water supply, distribution and monitoring for electronics racks and support sub systems requiring water-cooling, and the specification and design of new/modified and or re-purposed electronics water cooling services.

Deliverables: drawings: estimated 1 schematic, 3 detail/subassembly drawings

**Safety Subsystems Design**- This task encompasses all detailed tasks involving the evaluation of the existing PHENIX fire detection & suppression, HSSD, Water leak detection, ODH, monitoring,

interlocks, alarms, PASS system integration, and the specification and design of new/modified and or re-purposed equipment for these safety systems.

Deliverables: drawings: estimated 4 schematic

Detector Support Services Systems Design - This task encompasses all detailed tasks involving the specification and design of detector support services including cable routing and management, fibers, cooling lines, monitoring and control lines, etc., including cable trays, mounting hardware etc., racks and in-rack support services (e.g. fan trays), dry air, experimental gases, N2 and shop air.

Deliverables: drawings: estimated 101 schematic drawings

Detector Access Design - This task encompasses all detailed tasks involving the specification and design of platforms, stairways, walkways, including access control, safety barriers etc.

Deliverables: drawings: estimated 4 assembly, 2 schematic, 5 detail/layout drawings

Non -IR Infrastructure - This task encompasses all detailed tasks involving the specification and design of changes, upgrades and improvements for existing PHENIX Rack Room, Control Room, Gas Pad, etc. as needed to efficiently and effectively support sPHENIX

Deliverables: drawings: estimated 4 schematics, 5 detail drawings

Each of these subtopics includes design/safety reviews as necessary.

1. Project Title:	2. Date:	3: Person Responsible
SPHENIX	01/15/2015	P. Giannotti

4. WBS Element Code	5. WBS Element Title
1.09.03 Installation	Infrastructure Production

6. Index Line Number:	7. Revision Number and Authorization:	8: Rev. Date

9. Approved Changes

9. Element Task Description
<p><b><u>COST CONTENT:</u></b></p> <p>The costs associated with this item are for both labor and materials. The labor is the effort by scientists, engineers, designers, technical staff and BNL trades associated with the procurement of material and equipment described in the infrastructure design WBS dictionary entry. All labor and material estimates for this are based on engineering estimates.</p> <p><b><u>TECHNICAL SCOPE:</u></b></p> <p>This item includes all tasks and costs required to procure material and equipment for the following SPHENIX infrastructure items</p> <ul style="list-style-type: none"> <li>a. Mechanical support structures (those structural components of the sPHENIX detector which integrate and structural support the various detector subsystems that comprise the sPHENIX detector, including the Central support pedestal carriage base, base to HCal support, Base to bridge support, bridge, mid platform, Inner HCal to outer HCal support rings, Tracking support, flux return end caps and magnet support mounting and associated alignment features)</li> <li>b. AC Line Electric Power Distribution Components</li> <li>c. Cryogenics Supply Support (Note: this includes only structural support for routing of cryo supply. Actual cryo transfer lines and all associated plumbing and control hardware are part of the Magnet WBS item #1.03)</li> <li>d. Beampipe/vacuum Components</li> <li>e. IR HVAC Components</li> <li>f. IR Electronics cooling water Components</li> <li>g. Safety subsystems Components</li> <li>h. Detector support services systems Components</li> <li>i. Detector support services systems Components</li> </ul>

## j. Non -IR Infrastructure Components

### WORK STATEMENT:

The efforts required to complete this WBS item are described for the various subtasks as follows:

**Mechanical Support Structures Procurement** - This task encompasses fabrication and procurement of all components of the central pedestal carriage, inter detector connecting hardware and support structures, including Central Pedestal Carriage components and hardware, Hillman rollers on central carriage, alignment hardware, hydraulic jacking hardware, Outer HCal cradle, Inner HCal to Outer HCal mounting ring, bridge platform supports, Magnet mounting and alignment provisions, Magnet stack support structure, and flux return end caps.

Deliverables: Central Pedestal Carriage components and hardware, Hillman rollers on central carriage, alignment hardware, hydraulic jacking hardware, Outer HCal cradle, Inner HCal to Outer HCal mounting ring, bridge platform supports, Magnet mounting and alignment provisions, Magnet stack support structure, and flux return end caps.

**AC Line Electric Power Distribution Procurement** - This task encompasses fabrication and procurement of all components required to upgrade the existing 110 and 220 V AC electrical power distribution including breaker boxes, power cables and distribution of services to the various carriages, racks and off-carriage stations around the IR to accommodate the new sPHENIX detector subsystems.

Deliverables: AC Line Electric Power Distribution Components

**Cryogenics Supply Support Procurement** - This task encompasses fabrication and procurement of all components and for IR modifications and structural supports for the sPHENIX magnet cryo transfer line. Cryo transfer line and related cryo components are described under the Magnet WBS details.)

Deliverables: Cryogenics Supply Support Components

**Beampipe/Vacuum Procurement** - This task encompasses fabrication and procurement modifications and new components of the existing beampipe sections, beampipe supports throughout the IR, vacuum valves, pumps, controls, etc.

Deliverables: Beampipe/Vacuum: modification to existing components and new components

**IR HVAC Procurement** - This task encompasses fabrication and procurement of modifications and additions to components of the existing IR environmental control system including Air conditioning units (air handlers and compressor/condensers), thermostatic controls, humidity control, etc.

Deliverables: IR HVAC: modification to existing components and new components

**IR Electronics Cooling Water Procurement** - This task encompasses fabrication and procurement of modifications and additions to components of the existing PHENIX experimental cooling water supply,

distribution and monitoring for electronics racks and support sub systems requiring water cooling.  
Deliverables: IR Electronics Cooling Water: modification to existing components and new components

Safety Subsystems Procurement -. This task encompasses fabrication and procurement of modifications and additions to all components of the existing PHENIX fire detection & suppression, HSSD, Water leak detection, ODH, monitoring, interlocks, alarms, PASS system integration.  
Deliverables: Safety Subsystems: modification to existing components and new components

Detector Support Services Systems Procurement - This task encompasses fabrication and procurement of all components of detector support services including cable routing and management, fibers, cooling lines, monitoring and control lines, etc., including cable trays, mounting hardware etc., racks and in-rack support services (e.g. fan trays), dry air, N2 and shop air.  
Deliverables: Detector Support Services Systems: modification to existing components and new components

Detector Access Procurement - This task encompasses fabrication and procurement of all components of the of sPHENIX platforms, stairways, walkways, including access control, safety barriers etc.  
Deliverables: Detector Access: modification to existing components and new components

Non -IR Infrastructure Procurement - This task encompasses fabrication and procurement of all services, equipment and components for changes, upgrades and improvements to existing PHENIX Rack Room, Control Room, Gas Pad, etc. as needed to efficiently and effectively support sPHENIX)  
Deliverables: Non -IR Infrastructure: modification to existing components and new components

Note: (Assembly and installation of the above infrastructure components is not included in these estimates, see WBS 1.10 for assembly and installation details)